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EMERGENCY PREPAREDNESS

FOR FAMILY AND FARM

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University of Minnesota

EMERGENCY PREPAREDNESS FOR FAMILY AND FARM

Table of Contents

IN THE EVENT OF EMERGENCY

What to do	Unexpected explosion	Alert signal*	Attack warning signal†	Radio instructions‡
At home	Drop to floor. Get under bed or heavy table. Keep away from windows. Stay inside.	Turn on radio. Follow emergency instructions.	Turn off appliances. Go to shelter. Turn on radio. Remain under cover.	When alert signal sounds, turn on your radio. This is essential for receiving latest emergency information and instructions.
At work	Drop to floor. Get under desk or work bench. Keep away from windows. Stay inside.	Turn on radio or other communications media. Follow emergency instructions.	Obey emergency instructions. Go to shelter. If possible turn on radio. Remain under cover.	Because of local conditions, plans for individual communities may differ. Know what instructions your community has planned.
At school	Drop to floor. Keep away from windows. Cover face with hands.	Obey your teacher. Follow emergency instructions.	Obey your teacher. Go to assigned shelter. Remain under cover.	
In the open	Drop to ground or dive for cover. Cover face with hands.	Go to nearest radio for emergency instructions.	Obey emergency instructions. Go to nearest shelter. Listen to radio. Remain under cover.	Ask your local civil defense director for information on shelter and relocation in your community.
In a vehicle	Drop to floor. Cover face with hands.	Turn on car radio or go to nearest radio for emergency instructions.	Pull over to curb and stop. Obey emergency instructions. Go to nearest shelter. Listen to radio. Remain under cover.	

* A steady 3- to 5-minute blast of sirens or whistles. Listen for essential emergency information.

† Wailing tone or series of short blasts continuing 3-5 minutes. Take protective action immediately—the United States has been attacked.

‡ Because of fallout radiation danger, stay in your shelter until otherwise instructed. Keep your radio tuned to the radio station giving information about your locality. It is your EMERGENCY BROADCAST SYSTEM station.

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Family and farm emergencies can occur with little or no warning. That's why you carry fire, automobile, and health insurance. But are you prepared to protect your family or farm in case of a widespread natural disaster? Floods, tornadoes, windstorms, and blizzards occur without warning in Minnesota; they will occur again. Now nuclear attack is also on the list of disaster possibilities.

Widespread disasters cause unnecessary hardship and death, especially among people who are not prepared. But you can avoid disaster by being prepared, by planning for survival. This handbook describes two emergency preparation plans—one for your family, another for your farm.

Since nuclear weapons create new and unfamiliar problems, the handbook is concerned primarily with protection and survival during an all-out nuclear attack. This information is also pertinent for use during a natural emergency.

About Fallout

No one knows what areas will be hit in a nuclear attack. Authorities assume the enemy will aim for large military installations and industrial centers. Although they are unlikely targets, rural areas may be affected by fallout from explosions hundreds of miles upwind.

What Fallout Is

When a nuclear weapon explodes near the ground, thousands of tons of earth and debris melt or vaporize. These materials rise in a mushroom-shaped cloud and mix with radioactive materials from the bomb. High altitude winds carry this mixture until it condenses into a fine dust and falls to earth. **This dust is fallout.** It is dangerous because it contains large quantities of radioactive materials that give off rays harmful to living tissue.

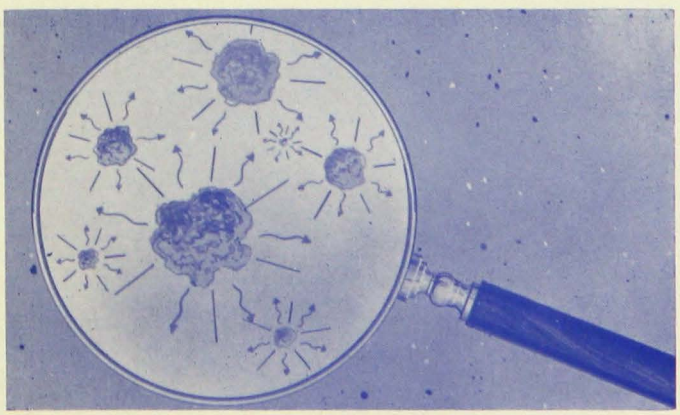

Figure 1. Fallout particles are like grains of dust or sand.

Characteristics of Fallout

You can't smell or taste fallout, nor can you feel its rays. If fallout is heavy, you may see it in the air or on smooth surfaces. It looks like ordinary dust or sand. If fallout is light, it may be invisible and detectable only with special monitoring equipment.

Where and When Fallout Settles

Where fallout settles depends upon the amount of rain and snow, air currents, topography, and, most important, the high altitude winds that carry fallout through the air. These winds may blow in different directions than surface winds.

Generally, fallout from one bomb settles in an elongated or crescent-shaped area extending downwind from the explosion center (figure 2). The pattern is extremely irregular in outline. Contamination within an area is usually not uniform; there may be local areas of extreme danger, others with very little contamination.

In addition an area may receive fallout from more than one explosion.

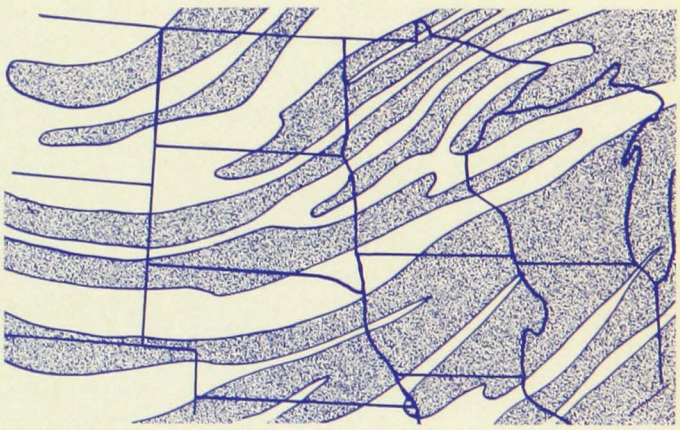

Figure 2. A possible fallout pattern covering the midwest.

Fallout takes time to settle. The heaviest particles begin descending near the explosion in about 30 minutes. Lighter particles take longer to settle and may not affect some areas for 24 hours or more. About half the fallout comes down during the first 12 to 16 hours after the explosion, but dangerous amounts can continue falling for several days.

The Danger of Fallout

Each fallout particle is like a miniature X-ray machine and emits energy rays called gamma rays. This fallout radiation consists mainly of gamma rays and beta particles. Fallout radiation travels in all directions like light from an electric light bulb.

Gamma rays, like X-rays, can penetrate most materials, including your body. Gamma rays can damage or de-

stroy living cells and reduce the cells' ability to divide and grow. If many cells are destroyed, sickness and even death may result. However, thick layers of dense materials absorb most of the gamma rays before they can reach the other side. This is why a shelter built of heavy materials can protect you from fallout.

Beta radiation is not very penetrating, but it can cause burns if fallout dust gets on your skin and isn't washed off. Ordinary clothing, a tarpaulin, or any cover that keeps out dust can protect against beta radiation.

Fallout radiation cannot make anything else radioactive. You can't catch radiation sickness from others, and you can safely consume food or water through which fallout rays have passed. It's only when fallout particles get into food supplies that they become unusable. If you consume large amounts of food or water containing fallout particles and enough radioactive elements get inside your body, you'll suffer internal injury. However, during nuclear attack the danger of swallowing radioactive particles is far less than the danger of exposure to gamma radiation.

Radiation Is Not New

Fallout isn't the only source of radiation. In your lifetime, you'll be exposed to about 10 roentgens* from natural sources, including cosmic rays from the sun and rays from radioactive elements in the ground. You'll also be exposed to radiation from chest and dental X-rays and even to beta rays from luminous watch dials. These small amounts do no apparent harm; you'll suffer ill effects only if you're exposed to large amounts.

Table 1. Expected effects of exposure to fallout radiation

Exposure in roentgens in 4 days or less	Probable effects
Up to 50	No observable effects.
50-200	Some nausea and weakness. Medical care usually not required. May continue working.
200-450	Majority suffer nausea and a few days' sickness soon after exposure. A period of 1-3 weeks without further discomfort follows. After this time, there is loss of hair and moderately severe illness. Most people require medical care. More than half recover.
450-600	Same general symptoms and discomfort as above but more serious. Patients suffer extensive hemorrhaging and complicating infections. Less than half recover.
Over 600	Severe nausea and diarrhea until death within 2 weeks. Few survive.

* A roentgen is a unit for measuring radiation amounts.

Safeguards Against Radiation

Radioactive materials must decay by themselves; their radioactive properties cannot be destroyed. But time, distance, shielding, and decontamination are four safeguards against them.

Time is a natural safeguard because much of fallout's radioactive material decays rapidly. Some materials lose half their strength in less than a day; other radioactive materials decay at a much slower rate, taking years to lose even half their strength. On the average, fallout giving off 1,000 roentgens per hour 1 hour after the explosion gives off 100 roentgens per hour 7 hours later. In 2 days it gives off 10 roentgens per hour and in 2 weeks 1 roentgen per hour. After that fallout loses its strength very slowly.

After 2 or 3 days you may be able to come out of your shelter for 1 or 2 hours if fallout is light. As it decreases, you can stay out longer. If you're in a heavy fallout area, you may have to stay inside 2 weeks or more.

Distance is a natural safeguard because radiation becomes less intense the farther you are from its source.

Shielding—putting a mass of material between you and fallout (figure 3), is the most practical safeguard.

Decontamination means removing fallout from a contaminated article to a place where it can do no harm.

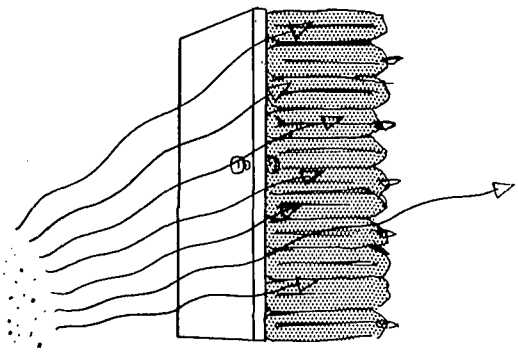

Figure 3. Thick shields of dense materials reduce the amount of radiation that enters.

The Danger of Fires

In the event of nuclear attack, rural areas wouldn't suffer as much fire damage as was once thought. Recent studies have shown that materials such as dry newspapers and grass wouldn't ignite beyond 20 miles from the point of explosion.

However, you should be familiar with basic farm and home fire prevention and firefighting methods in case you're within 20 miles of an explosion. A bomb may stray off its course and explode in a rural area, or fires may occur from causes unrelated to nuclear explosions.

About Severe Weather Emergencies

Severe weather emergencies strike parts of Minnesota nearly every year.

A tornado is a rapidly spinning funnel-shaped cloud extending to the earth from the base of a storm cloud. When nearby, a tornado sounds like the roar of thousands of planes and may be heard for several miles. Tornadoes usually move in an easterly direction at speeds of from 25 to 40 miles per hour. They may travel from 10 to 40 miles. The average width of the tornado path is about 250 yards. Winds within a tornado may reach speeds of 500 miles per hour.

Most Minnesota tornadoes occur during June, although they have developed during every month from March to December. "Tornado weather" is characterized by hot humid days with southerly winds and threatening cloud formations. Most tornadoes form between 3 and 7 p.m., although they may strike at any hour.

Minnesota averages more than a dozen reported tornadoes each year. They have been sighted in nearly every county, but most occur south of a line from East Grand Forks on the North Dakota border to Pine City on the east.

Tornado Safety

During tornado weather—hot humid days with threatening cloud formations—keep your radio on and tuned to a radio station that gives frequent local weather reports.

When a tornado watch is issued by the Weather Burea forecasting the possibility of tornadoes in your area, alert your family and inform your neighbors. Keep a sharp eye on changing cloud formations and prepare to take cover. Keep listening to the radio.

If a tornado is sighted or reported heading your way or heavy storm winds develop, seek the best available shelter.

At Home

- Go to your storm cellar, vegetable cellar, or fallout shelter. If you have no special shelter, go to the basement corner that's farthest below ground level and nearest the approaching tornado (usually the southwest corner). If you have no basement, crawl under heavy furniture in the middle of the house. Stay in your shelter until you're sure danger has passed. Take your battery-operated radio and flashlight with you.
- Leave windows open slightly on the side of the house opposite the approaching funnel. This will equalize the air pressure inside the house.
- Stay away from windows.

Outdoors

- If you're in a car, move away from the tornado path at a right angle.
- If you're in the open lie down flat in the nearest depression—a ditch, ravine, or culvert. Stay there until danger from flying objects has passed.

Winter Storms

Minnesota averages at least one severe winter storm each year, usually in November or March. Deep snow, strong winds, and sleet create most problems. Families should be prepared for extended electrical outages and several days' isolation during cold weather. Refer to a following section, "Equipment for Emergencies."

Warning Signals and Information

Two civil defense signals warn of approaching danger. When you hear the alert signal, a steady 3- to 5-minute blast, turn on the radio for emergency information. When you hear the attack warning signal, a wailing tone or series of short blasts lasting 3 minutes, take protective action immediately. These signals may be sounded on horns, whistles, or sirens. Regardless of the device used, you should be able to recognize each signal and know how to act.

Warning is a special problem for people living far from community centers. Even the most powerful sirens and horns do not have the necessary range to reach outlying areas. A number of makeshift warning systems including partyline telephones, signal lights, signal flags, and a system whereby one person drives to all neighboring farms can be devised. But none of these methods is practical for all rural areas. Until an efficient system is perfected, the first warning of attack for many rural people may be intense light in the sky, an explosion, or both.

Regardless of the warning, A.M. radio will be your best means of receiving detailed information, advice, and instructions.

More than 50 Minnesota radio stations will be a part of the Emergency Broadcast System which will operate if a national emergency occurs. Minnesota is divided into seven civil defense operational areas. All radio stations in each area will broadcast the same information during the emergency. These stations are installing stand-by generators and fallout shelters for operating personnel.

In case of nuclear or natural disaster, keep your radio tuned to the Emergency Broadcast System station giving information for your area.

Family Survival

Though governmental agencies mark and stock public fallout shelters, your family's protection during a disaster also depends on your plans for adequate shelter, food, and health protection.

Family Protection Areas

Although there are public fallout shelters, a family protection area or shelter will effectively shield your family from fallout, especially gamma rays. Any building gives some protection, but an underground shelter provides maximum protection.

Table 2. Amount of protection various shelters offer

Shelter	Percent of outside radiation admitted	Protection factor
Above ground in small wooden home	10-50	10-2
Partially exposed basements of one- and two-story homes	10-50	10-2
Corners most below ground level of basements without exposed walls		
in (a) one-story homes	5-10	20-10
(b) two-story homes	2-35	50-30
Basement fallout shelters recommended by civil defense authorities	0.4-2	250-50
Vegetable storage cellars	0.4-2	250-50
Underground shelters recommended by civil defense authorities	0.1 or less	1,000 or larger

In a single-family dwelling you're safer in the basement than above ground because in the basement fallout radiation will come mostly from above with very little from the sides. Above ground you're safer in the center of a building than near an outside wall.

For your home shelter, choose the most protected area in your home and add more shielding material to it or build a new shelter area. You can build increased protection into root cellars, storm cellars, and basements.

Most civil defense approved community shelters aim at a minimum protection factor of 40. This means that shelter occupants receive only one-fortieth of the radiation that is outside. Your home shelter should also have a protection factor of at least 40. Table 2 shows the amount of protection various shelters offer.

Improving Family Protection Areas

Most Minnesota families living in single-family homes, duplexes, and triplexes participated in the 1966 Home Fallout Protection Survey conducted by the Census Bureau. Families having basements in their homes received a green booklet called *Fallout Protection For Homes With Basements.* A label on the booklet gives the fallout protection rating for your basement.

Following are methods for increasing fallout protection factors for corners of home basements where the floor is 6 feet or more below ground level on all sides.

In a two-story home: When fallout protection is needed, move all furniture, books, and appliances on the first floor of the house into the room above the best corner of the basement. Set mattresses, sofas, and other comparatively light items on end to increase the mass of material between the basement and the roof.

In a one-story home: Fill in the space between the joists of the basement ceiling over the corner farthest below ground level with 3-4 inches of concrete or clay bricks. Plans are available at county extension offices.

Much of the radiation entering a "walk-out" type basement comes from fallout on the ground near the exposed walls. Additional side protection is needed. Select the basement corner most below ground level. Enclose it with two more walls of concrete blocks. Use solid blocks 8 inches thick or use hollow blocks 12 inches thick and fill the hollow cores with sand. Allow at least 10 square feet of floor space for each person. The shelter doorway should face away from the exposed basement walls. Refer to plans in *Family Shelter Designs* for more ideas on constructing suitable shelters in a one-story home.

To increase overhead protection follow the previous instructions for one or two story homes. One or both walls may be used to support the added ceiling weight.

Other Types of Shelter For Storms and Fallout

Several types of home shelters are shown on the following pages. Some of these shelters can be do-it-yourself projects costing about $150, the more complex shelters require a considerable financial investment and the skill of a competent building contractor.

For full information on home shelter construction, ask your local civil defense director or your county agent for the booklet, *Family Shelter Designs* (H-7), prepared by the Office of Civil Defense. Building supply dealers and contractors can also give you advice and plans for home shelters. Your county agent can give you complete information about fallout shelter plans available from the Minnesota Agricultural Extension Service. Plans for figures 7 and 8 are in *Family Shelter Designs,* the plan for figure 6 is an adaptation of the plan on page 23 of *Family Shelter Designs,* and plans for figures 4 and 5 are available through your county agent.

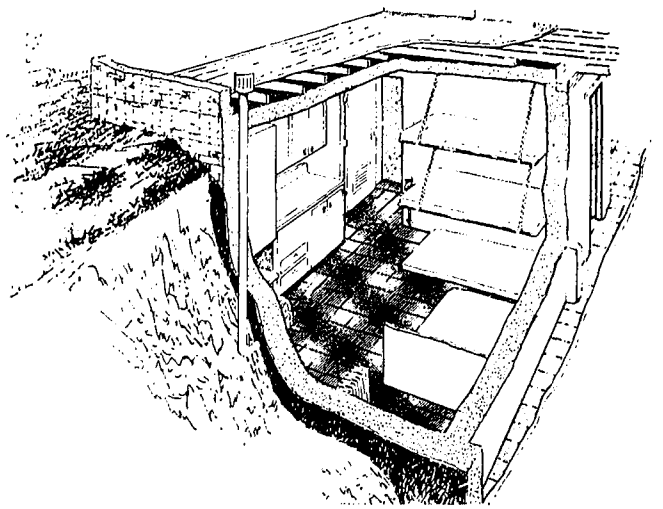

Figure 4. Basement shelter for six to be built with a new home.

This basement shelter for six persons is intended to be built with a new house. It should be built in the corner of the basement where earth on the outside wall reaches the ceiling. Advantages of this shelter include multiplicity of uses, flexibility of shape, and use of materials and labor that tie in with the house's construction. Its protection factor is 100. You can construct an effective fallout shelter either above or below ground. Figures 5 and 6 are good examples of above- and belowground shelters.

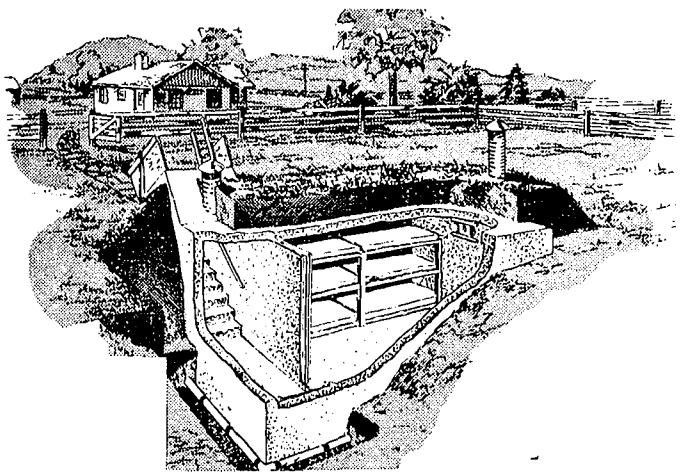

Figure 5. Backyard underground shelter for six.

Except for its heavier construction and reinforced entrance, this backyard underground shelter for six persons is similar to a cyclone cellar. It can be used as a storm, storage, or fallout shelter. Main advantages are flexibility of shape and multiplicity of uses. Protection factor is about 2,600.

This aboveground earth-covered log shelter for eight people is especially suited for areas where logs are available. Only a small portion provides standing room, but almost the entire structure allows space for sitting and storage. This shelter's principal advantage is that it can be built in areas where the ground water table is near the surface. With a 2-foot earth cover and sufficient shielding near the entrance, this shelter's protection factor can reach 500.

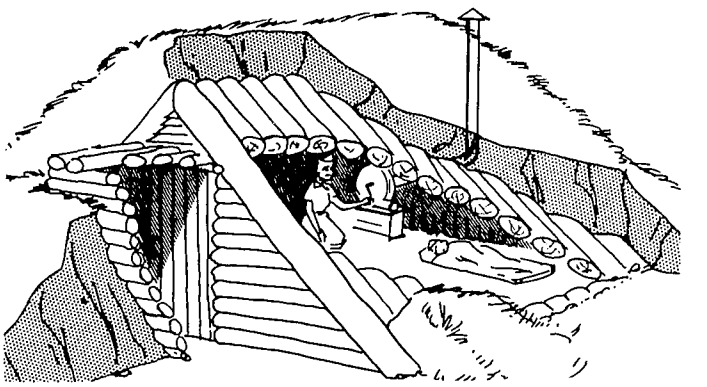

Figure 6. Earth-covered log shelter for eight.

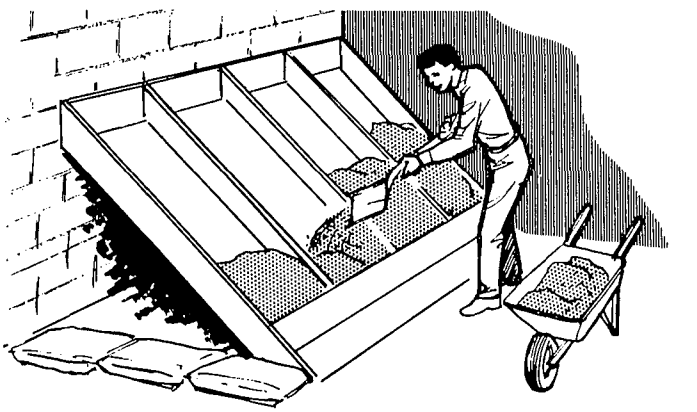

Figure 7. Basement sand-filled lumber lean-to.

The basement sand-filled lumber lean-to pictured above in Figure 7 will protect three persons. The house itself gives partial protection, and sandbags block the ends of the shelter. Advantages are low cost, simplicity, and general availability of materials. Protection factor is at least 100.

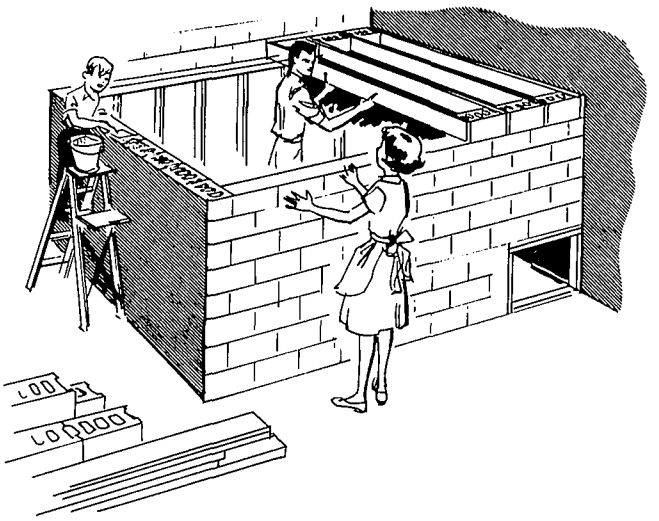

Figure 8. Sand-filled concrete block shelter.

This inexpensive sand-filled concrete block shelter will protect four persons. It's intended to be installed in a belowground basement. Advantages include simple design, speed of construction, and availability of materials. Protection factor is at least 100, but by adding a baffle wall, protection can be increased. By increasing the ceiling height to 6 feet or more this shelter can serve as a dual-purpose room.

In planning a home shelter, consider these factors:

Radiation shielding: Choose construction materials that offer maximum radiation protection. The heavier and denser the material between you and fallout, the less radiation you'll receive. Remember, your shelter should have a protection factor of at least 40.

Fire resistance: In building your shelter, use as few combustible materials as possible. Use noncombustible furnishings and storage containers and cots instead of mattresses.

Space: Provide at least 10 square feet of floor space per person. No shelter should have less than 25 square feet of floor space. The height should be at least 4 feet.

If heavy fallout occurs, the first few days after an explosion must be spent within the shelter. Because radiation intensity decreases with time, you could then spend some time outside the shelter. This means you could plan to use a less-sheltered area immediately adjacent to your shelter for storage and a larger living space. This will allow you to expand into more comfortable quarters after the first few critical days.

Ventilation: Mechanical air blowers are optional in basement shelters since air will enter through door cracks and other crevices. Fallout dust is not likely to enter through these cracks in any considerable amount because most of it will be stopped by the house above. Underground shelters need ventilation systems. One simple system consists of a 3-inch intake pipe, a hand-operated blower, and an exhaust pipe. The intake pipe should extend at least a foot above ground and be covered with a weather cap or have two right-angle bends to stop fallout particles.

Lighting: Provide for continuous low-level lighting. Electric power stations may continue to function after a nuclear attack, so you can install light and power outlets from your home electrical circuit. But keep a storage battery in the shelter in case central electrical power fails. Increase the effectiveness of your lighting by painting the shelter ceiling white and installing metallic foil reflectors behind light bulbs. Flashlights and battery lanterns will provide brighter light for reading and emergencies. Do not use kerosene- or gasoline-burning lanterns in the shelter because they burn oxygen and give off fumes.

Drainage: Since drainage problems differ with location, obtain reliable local advice before building an underground shelter.

Heating: In moderate weather the inhabitants' body heat will keep your shelter warm. For cold weather install an electric space heater. Also stock your shelter with extra blankets and clothing in case electric power is unavailable. Do not use fuel-burning space heaters because they give off carbon monoxide.

Doors and windows: For a basement shelter, use heavy shielding material to block windows. In planning such a shelter, you might consider including a baffle wall in front of your shelter entrance. Because nuclear radiation usually travels in straight lines, the right angle turn of the baffle wall will stop most radiation from coming through the shelter entrance.

Storage space: Make provisions for storage shelves and compartments for special equipment. Make space allowances for ventilation pumps, water storage containers, firefighting equipment, and cots. If you use bunks instead of cots in a basement shelter, put them in before the walls are completely built or you may not get them through the narrow passage left by the baffle wall.

Improvised Fallout Shelters

A permanent shelter is more satisfactory than an improvised one because it offers greater protection and is ready for use even if warning time is short. If attack comes before you've built your shelter, remember these guidelines for improvising last-minute protection:

- Basements usually provide better shelter than aboveground floors. In large buildings the central areas of middle floors offer good protection.

- A corner of a belowground basement is better than the center.
- On aboveground floors, improvise shelter away from outside walls.
- Keep the shelter small. Concentrate the shielding mass immediately around and above you to save construction time.
- Stay away from windows. They're weak points in your fallout shield.

Before fallout starts, get your family into the shelter. Stay there as much as possible until you're informed it's safe to come out for short periods. It's especially important to stay in your shelter for the first 2 days after a fallout warning.

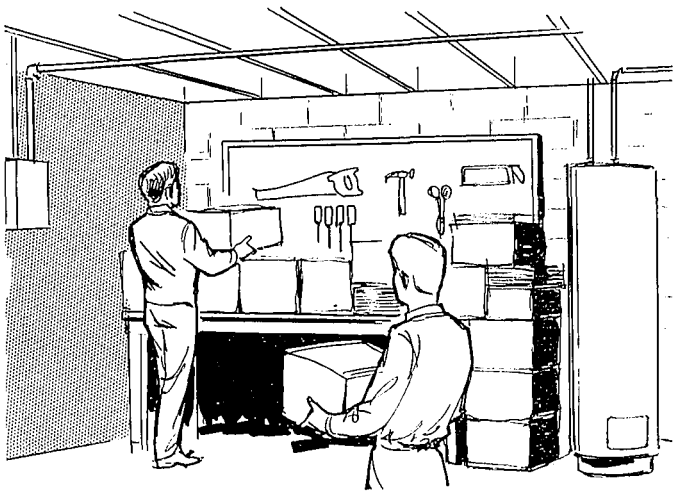

Figure 9. A shelter can be improvised around a workbench.

An improvised shelter can be made in a basement corner by stacking heavy material on top of and around the open sides of a workbench (figure 9). Pile dirt and other heavy material in basement window wells for increased protection.

Fallout protection may be increased by moving furniture so it can be bridged with doors from the interior of the house. Books, appliances, and other home furnishings may be piled around and above this small enclosure. This arrangement will provide additional protection in a small area that can be tolerated for the first and most important hours when fallout radiation is most intense (figure 10).

The more warning time you have the better shelter you can improvise. Here are directions for a shelter (figure 11) that takes about 6 hours to prepare.

In the best protected corner of your basement, place a wooden beam (4" x 4") crosswise below the joists to reinforce the middle of the above floor. Support the beam with postjacks or other posts placed on short pieces of plank on the basement floor. Then fill the room above the

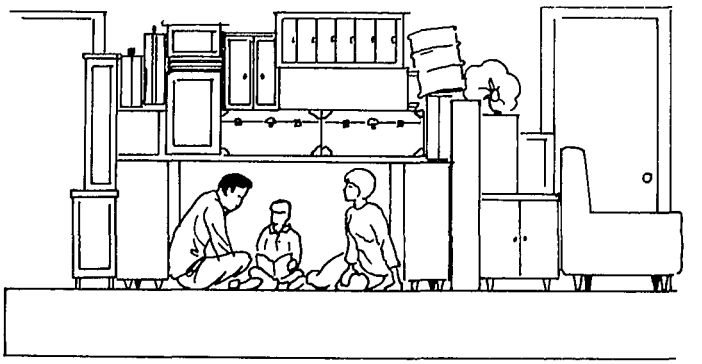

Figure 10. Improvised shelter using furniture and doors.

shelter to the depth given with one or a combination of the materials shown in figure 12. Other materials may be used to obtain 90 to 100 pounds of material per square foot of floor space.

Enclose an area of the basement corner by building temporary walls from bagged fertilizer, vegetables, grain, dirt, feed, or baled hay. (If baled hay is used, walls should be at least 9 feet thick.) Allow 10 square feet of floor space per person. Place the bags crossway in wall and crisscrossed at ends and corners for better stability. Make an entrance near an existing basement wall. Cover windows in the shelter area with any of the materials mentioned below.

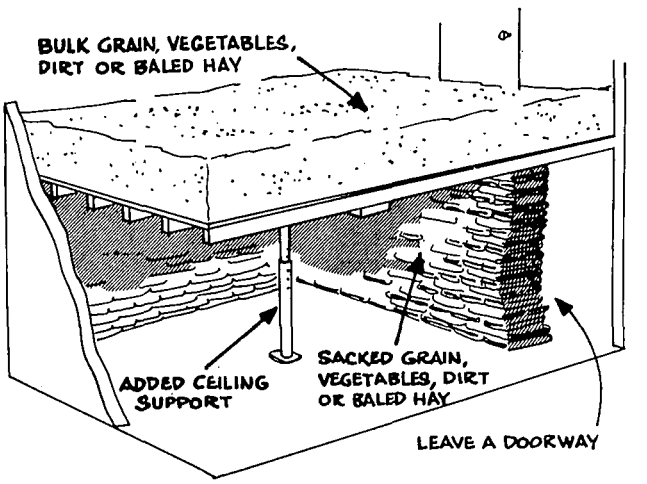

Figure 11. Farm materials can be used to build a basement-corner shelter.

Equipment for Emergencies

Although you may be able to leave your shelter briefly 2 or 3 days following a nuclear attack, prepare to be completely self-sustaining for at least 2 weeks. Make plans for equipment, food, water, clothing, and other essentials to carry you through an extended emergency.

Select equipment carefully, since unnecessary items will take up valuable shelter space. Use the checklist at the end of this bulletin (table 7) for keeping a record of equipment and supplies.

Store equipment in an accessible place, away from dirt, moisture, and mechanical damage. Your family protection area may be the best storage place, but you can keep equipment in the basement, garage, cabinets, or utility room if each family member can get his assigned items into the shelter quickly.

Here's the checklist of equipment you'll need for your shelter:

For Cooking and Serving

Canned heat or a camp stove: Camp stoves that burn gasoline or kerosene can be used in the basement, but not in a shelter because they use oxygen and give off carbon monoxide.
Serving dishes and cooking utensils: Include a paring knife, large spoon, fork, and measuring cup.
One or two cooking pans.
Pot holders.
Aluminum foil: Use it for wrapping leftovers, lining pans to lessen dishwashing, and dividing pans to heat several foods at once.
Disposable knives, forks, spoons, plates, cups, and napkins: Estimate how much you'll need for 2 weeks. Plastic dishes and tableware may be used, but water for washing them may be limited.
Can and bottle openers.
Medicine dropper for measuring water purifier.
Matches.
Powdered soap and dish towels.

For Communication and Radiation Detection

Portable radio and spare batteries: Batteries for transistor radios usually don't wear out as fast as those for regular portables. Check the radio reception in your shelter to determine if an outside antenna is necessary.
Radiation meters: A citizen's kit containing instructions and instruments for measuring radiation intensity and total doses is available through department stores for $25.

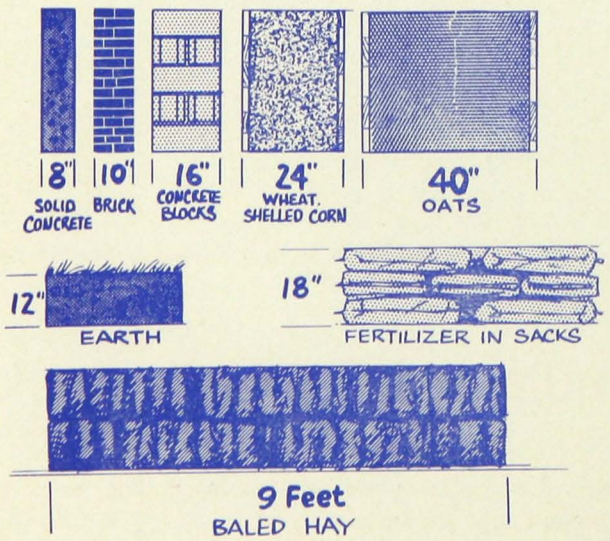

Figure 12. These materials in these amounts offer the same shielding protection as 8 inches of solid concrete.

For Lighting

Waterproof flashlight with extra batteries.
Six-volt cell lantern with spare battery.
Candles.
Lanterns with extra wicks and fuel: Kerosene and gasoline lanterns shouldn't be used in a small shelter because they use oxygen and give off fumes.

For Sleeping

Bedroll or sleeping bag for each person.
Extra blankets.
Plastic sheets, oilcloths, or canvas covers to prevent mildew during storage and to use as ground cloths.

For Sanitation

Large covered container such as garbage can or 10-gallon milk can.
Covered pail.
Toilet tissue.
Disinfectant.
Plastic and paper bags.
Sanitary napkins.
Wash basin.
Soap.
Paper towels.

For Baby

8 to 10 nursing bottles and nipples.
Metal funnel.
Measuring spoons.
Measuring cup.
Pan for mixing.
Kettle for sterilizing equipment.
7 clean towels or feed sacks.
7 dozen disposable diapers.
Soap.
Wash cloths.
Towels.
Emulsion or talcum powder.
Safety pins.
Toilet and cleansing tissues.
Blankets.
Warm clothing.

Other Items

First aid kit.
Prescription medicines.
Sewing kit.
Screwdriver.
Pliers.
Hatchet.
Shovel.
Broom.
Recreational supplies including magazines, games, song books, puzzles.

Water

Water systems might be shut down or their supplies contaminated during an emergency. Since many rural homes won't have water if electric power fails, you should have a 2-week supply near your shelter.

You'll need at least a half gallon of water a day for drinking and food preparation. This amounts to about 7 gallons per person for a 2-week period. If you want water for bathing, brushing teeth, and washing dishes, store another 7 gallons per person. For each child under 3, store another 2 gallons for bathing and laundry.

Storing and Replacing Water

Plastic or glass jugs, fruit jars, or bleach bottles are good storage containers if their lids fit tightly. Metal containers are safe to use, but they may give water an unpleasant taste. Protect glass containers from breakage and light by packing them in newspapers, excelsior, or other padding material.

Since drinking water may develop undesirable tastes and odors during storage, check the supply every 3 months and change it when necessary.

If an emergency warning comes and you haven't stored any water, quickly collect it in pots, jars, bottles, and jugs. Fill the bathtub and sinks and cover with plastic to keep out dust and fallout.

Sources of Water

Water-packed fruits and vegetables are good liquid sources if containers are undamaged. Fresh fruits, especially citrus fruits, are also good sources but wipe and peel them before use.

Once you can leave the shelter, part of your water needs can be met with reserves, such as melted ice cubes and frost in your freezer. You can drink the water in your water heater, pipes, and flush tanks on toilets if you shut off the main valve into your home so that contaminated water can't enter. Get water from the hot water heater by opening the drain cock at the bottom of the tank. For safety, turn off the water heater's gas valve or electric power.

When you can go outdoors after a nuclear attack, you'll find safe water in sealed and covered wells. A cistern can be a water source if it isn't contaminated with fallout particles washed from the roof. If your cistern isn't in regular use, you can store well water in it, but pump out and refill it at intervals. Water from springs, farm ponds, and creeks shouldn't be used unless authorities confirm its safety or you know how to make it safe.

Purifying and Decontaminating Water

Making water safe after a nuclear attack involves two processes—freeing it from germs (purifying it) and freeing it from radioactive fallout (decontaminating it). If you suspect that your water contains germs, purify it by:

Boiling: The safest way to purify water is to boil it vigorously for 2 minutes. Add a pinch of salt or pour the boiled water from one container to another several times to improve the taste.

Bleaching: Any liquid household bleach containing hypochloride, a chlorine compound, as its only active ingredient purifies water. Add bleach to water, stir or shake vigorously, and let stand 30 minutes. The water is pure when it has a distinct chlorine taste or smell. The following table shows the amount of bleach to use.

Table 3. Amounts of bleach needed to purify water

Amount of water	Bleach needed to purify	
	Clear water	Cloudy water
1 quart (¼ gallon)	2 drops	4 drops
1 gallon	8 drops	16 drops
5 gallons	½ teaspoon	1 teaspoon

Iodine method: Use ordinary household tincture of iodine to purify small quantities of water. Add 3 drops to each quart of clear water, 6 drops to each quart of cloudy water. Stir thoroughly.

Tablet method: Water-purification tablets that release chlorine or iodine purify water. They're available at most sporting goods and some drug stores. Follow package directions.

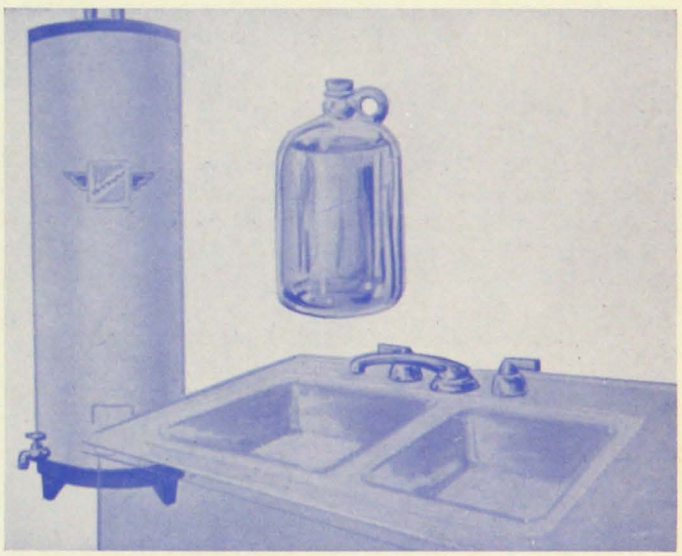

Figure 13. These can be sources of fallout-free water.

Water from cisterns and open sources such as uncovered wells, farm ponds, and creeks may be both impure and contaminated. If you must use it, know how to make it safe. A flower pot makes a simple and effective filter for removing fallout. Cover the bottom of the pot with a screen, cover the screen with two or three sheets of tissue paper or cloth, then 2 or 3 inches of small rocks. This type of filter will remove more than 90 percent of all radioactive materials.

Other methods of decontaminating water include straining it through several thicknesses of clean cloth or paper towels, mixing a handful of clay soil with each gallon of water and allowing it to settle out for a day, and running the water through a home water softener.

The latter method will remove up to 99 percent of all radioactive materials.

After you've filtered the water to remove fallout, you must purify it by one of the methods described previously.

Food

Whether you live in the country, a city, or a suburb, you should keep a 2-week food reserve on hand. Stock familiar foods because they're more heartening in times of stress. Your food stock should require no refrigeration and minimum cooking and be completely edible, hot or cold.

Include lightly-seasoned foods to decrease water needs. Salted nuts, ham, and fish increase thirst. Provide foods for babies, invalids, and persons on special diets. Eliminate the problem of storing leftovers and prevent waste by storing canned foods in sizes that will serve your family for one meal. It's especially important to quickly use foods that deteriorate rapidly after being opened. You should plan your food supply to leave a minimum of garbage and give off no strong, unpleasant odors.

Table 8 lists the kinds and quantities of food suitable for a reserve supply. If your family consists of four adults, store four times the amounts suggested. Teenagers need more than these amounts, younger children less. Use table 9 as a checklist for keeping a record of your food reserve.

Storing and Replacing Your Reserve Supply

The office of civil defense recommends two ways to store your reserve food—increase your regular food supply until it contains a built-in 2-week reserve, or store and maintain a special 2-week stockpile in your home or fallout shelter.

If you choose the first method, keep a list of foods you use and replace the food regularly. If you choose the second method, keep foods in their original containers and store them in a dry place not above 70° F. and not below freezing. Even foods wrapped in paper should be kept in their original wrappers, but the entire package should be placed in a metal container or wrapped in plastic and sealed with tape. Use a potato chip can or a 10-gallon milk container for storing foods packaged in paper. Once packages are opened, use such a container to keep the food fresh. Be sure all cans and packages are labeled with the purchase date since you'll need to replace everything about once a year. Use replaced foods for family meals and put fresh supplies at the back of the stockpile; keep older supplies in the front of your cupboard and use first.

Concentrated foods: You can purchase multipurpose foods and food kits designed for shelter storage. Nutritious, concentrated foods that can be used as food extenders and fortifiers are also available. These foods are easy to store and make a good supplement to your food supply, but remember that adding large amounts of them will increase the amount of water you'll need and thus can't be used exclusively.

Frozen foods: If your freezer is close enough to your shelter, you can use the foods in it. Even if the power fails, food in a well-insulated freezer won't spoil for several days. Food in small freezers spoils sooner than food in large ones. Once you open the freezer use the food in it as quickly as possible.

Precautions in Preparing and Serving Food

Since cooking won't destroy radioactivity, wash all foods exposed to fallout. Don't consume food from packages left open during fallout if any other food is available. Wash or wipe cans and packages thoroughly to prevent fallout from contaminating the contents. Foods with undamaged peels or rinds will be safe to eat if you remove the peel or rind carefully so that no fallout gets on the inner food. Wash leafy vegetables thoroughly and don't use them until you're sure they're free of fallout. If you pull off the outer layers of cabbage and lettuce heads, you can significantly reduce the radioactive fallout on these vegetables.

Estimate closely the amount of food to prepare in order to eliminate leftovers and reduce the time between preparation and serving.

The close living required in a shelter encourages the spread of disease, so follow these everyday health precautions in food preparation—don't taste food from the cooking spoon, wash your hands each time you use the toilet, and don't handle food when you have a cold or sores on your hands.

Dishwashing

Ideally you should scrape cooking and eating utensils, wash them in hot soapy water, rinse them in hot water, and sterilize them in boiling water for 2 minutes or dip them in water containing a few drops of 5-percent chlorine bleach. But you may not have enough water for thorough dishwashing so reduce the number of dishes you dirty by using paper plates and eating from containers. Use paper towels to wipe grease from utensils and aluminum foil to line pots and dishes.

Clothing

Although clothes can't shield you from gamma radiation, they can protect you from burns caused by fallout particles. If you must go outdoors while fallout is in the air, cover yourself completely. Wear a hat and neck scarf and tie the bottoms of your slacks over your boots and the ends of your sleeves over your gloves. Polyethylene film offers more protection than woven or knitted fabrics, but don't put the film over your face. If there is much dust, wear goggles and a filter mask. Before reentering the shelter, remove contaminated clothes, wash exposed body areas, and put on clean clothes. Don't bring contaminated clothes into the shelter.

Since there may be no heat in your home, choose warm clothes—coats, slacks, boots, gloves, scarves, and caps. Also choose clothes that are comfortable; loose-fitting garments are easy to wear over an extended period.

The type of clothing you choose depends on your family size, individual taste, and storage space available. If you store clothing in your shelter, pack it in metal closets, trunks, footlockers, or heavy cardboard boxes to make sure it's protected from dampness. If you don't have a shelter, keep your emergency clothes in a suitcase in the closet. If this is impossible, keep a list of necessary items attached to a closet door.

Health Protection

Staying healthy is especially important under emergency conditions. Bodily injury, radiation sickness, vermin, and contagious diseases are among health problems you may have to face. Your best emergency health protection is taking care of yourself now—have regular checkups and keep tetanus, smallpox, polio, and diphtheria immunizations up to date. Also, be prepared to give first aid, treat radiation sickness, keep sanitation at a high level, and decontaminate your home after an attack.

First Aid

A first aid kit containing the supplies listed in table 10, prescription medicines, and a good instruction booklet belong in your shelter. Arrange the contents in a metal box so you can find what you need without unpacking the entire box, and store it out of children's reach. Consider any family allergies when you're stocking your kit. Renew supplies every few months. If you can't keep a first aid kit in your shelter, at least keep all supplies where you can find them easily.

To use your first aid kit effectively, be sure one adult in your family has had either first aid or medical self-help training. A first aid course teaches what to do until the doctor arrives; a medical self-help course includes lessons on maintaining sanitary shelter conditions and acting when a doctor isn't available. Your local civil defense director can tell you where and when such courses are offered.

Treatment for Radiation Sickness

Your body can withstand some radiation without serious permanent injury. But if you're exposed to too much radiation too fast, radiation sickness and possibly death will result.

If someone in your family develops radiation sickness, make him rest. Give him aspirin for headaches and motion-sickness tablets for nausea. Have him sip salt water (1 teaspoon of table salt to 1 quart of cool water), as soon as possible for diarrhea and vomiting, but not until vomiting has stopped. For a sore mouth, have him use a salt water mouthwash.

Human Waste Disposal

During emergencies good sanitation is not only a matter of comfort, but also an important health precaution.

Your first task will be to make temporary toilet provisions. A metal pail with a tight cover can serve as a simple shelter toilet. A better device can be made by cutting the seat out of a chair and placing the chair over a pail. Hang an old shower curtain around the improvised toilet to provide privacy. You'll need a supply of plastic bags to use as pail liners, household bleach or creosol to control odors and insects, and a large garbage can or a 10-gallon milk can for storing used plastic bags. After you've been in the shelter for about 2 days, move the large can outside. Once you can go outside safely, bury wastes under 1 or 2 feet of earth.

In emergencies where fallout is not a hazard, construct a temporary pit toilet or use an existing privy; both are effective means of waste disposal over extended periods of time. Cover accumulated waste with 1 to 2 feet of earth when the toilet is moved or abandoned. To prevent wastes from contaminating water, make sure outdoor toilets are at least 50 feet away from any well, spring, or other water source.

Keep extra toilet tissue and a supply of sanitary napkins on hand. If your family requires rubber sheeting or other special sanitary equipment, make sure you have adequate supplies. Store at least a week's accumulation of newspapers for sanitary uses, for insulating bedding from floors, and lining clothes against cold.

Sanitation for Baby

Diaper laundering may be impossible during emergencies, so keep disposable diapers on hand. If you have none, make emergency diapers by lining rubber pants

with cleansing tissue, toilet paper, scraps of cloth, or other absorbent materials. Or, cut and fold to diaper size any moisture-resistant cloth and line it with absorbent material.

Garbage Disposal

Wrap garbage in several thicknesses of newspaper to absorb moisture and reduce odors. Then place in a covered can. Bury it as soon as you can go outdoors.

Vermin Control

Every few months paint or spray your shelter with a 5 percent solution of DDT or another insecticide containing chlordane, dieldrin, Diazinon, or ronnel—taking care against inhalation or skin contact. Eliminate lice and other body infesting insects with a 10 percent DDT dust left on the body and in clothing for 24 hours. Include screening material (cheesecloth), a fly swatter, and mouse traps in your shelter supplies. Don't use spray insecticides in an occupied shelter—they may injure eyes and lungs or explode.

Decontamination After an Attack

After all fallout is down and it's safe to go outdoors for a short time, decontamination measures will begin. The extent of a community's decontamination work will depend on the amount of fallout and the number of people available to help. Local governments will organize work units to perform necessary duties; you will probably be asked to help.

Local authorities can advise you about necessary decontamination around your home. You may want to wash off your roof, porch, and outside walls. But remember that fallout washed from the house will land on the ground and must be flushed to a safe area with a high-pressure hose.

Decontaminate your home's interior by vacuum cleaning or scrubbing with soap and water. Vacuum clean your floors, rugs, and furniture; scrub tables, walls, floors, and other hard surfaces. Don't attempt to decontaminate upholstered furniture by scrubbing—water will only carry fallout particles deeper into the material.

Don't expose yourself unnecessarily to fallout radiation. Cover yourself completely during decontamination operations; before reentering the shelter, remove contaminated clothing, wash exposed parts, and put on clean clothing. Don't bring contaminated clothing into the shelter.

Occupying Your Family's Time

When preparing for shelter life, plan activities to help pass the time quickly, take your family's minds away from worries, and help prepare them for life outside the shelter.

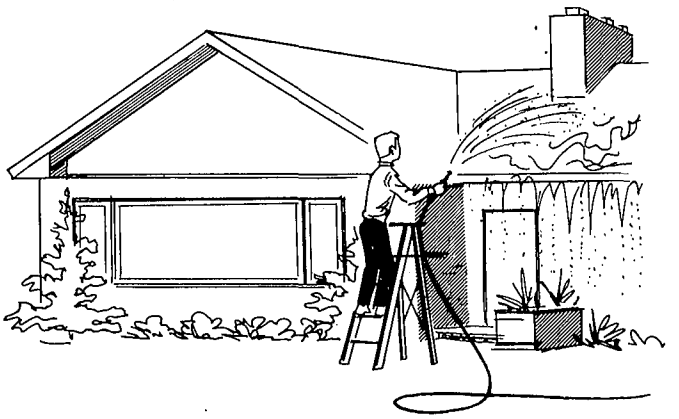

Figure 14. Fallout washed from buildings should be flushed to where it can do no harm.

Reading Material

Reading time will be ample in a shelter, so store plenty of reading material suitable to your family's ages and interests. Your supply may include a Bible, familiar storybooks, novels, nonfiction books, a collection of poems, magazines, books of riddles, brain teasers, and crossword puzzles. Since your family will probably be curious about what has happened and what to expect when they leave the shelter, be sure to include civil defense brochures and this handbook with your reading material.

Games and Toys

Table games for children and adults and simple toys for very young children will occupy idle hands. Favorite toys will represent the normal, secure world to young children.

Games should be as different from each other as possible and absorbing enough to divert attention from worry. Because you'll be under tension, choose games that aren't likely to create much noise or cause arguments. Card games, board games, pencil-and-paper games, and games that require only limited space are suitable. Jigsaw puzzles and games that can be played by one or several people are especially appropriate.

Music

Singing can help keep spirits high during periods of stress, so include songbooks in your supplies. You may even want to store toy instruments, harmonicas, or other small instruments to accompany singing.

Hobbies and Handicrafts

Hobbies and handicrafts requiring limited space can be carried on in a shelter, but remember that the bright light required by some handiwork may not be available. Store blocks and other construction toys for young children.

Exercise

When you leave the shelter, you may have to do heavy physical work, but living inactively in limited space can result in stiff muscles and physical weakness. So plan a program of regular, simple exercises for shelter living. Avoid strenuous exercises to prevent raising the shelter temperature or stimulating appetites.

Continuing Family Routine

Children who cannot understand their confinement will need reassuring activities. If you continue familiar practices such as taking naps, being responsible for certain chores, saying grace before meals, and having Dad read to them at bedtime, they'll feel a continuation of normal family life.

Planning for Life Outside the Shelter

Your family should discuss the probable situation outside the shelter, the dangers of postattack environment, and family needs. You can devise games that teach children to avoid touching contaminated objects. Your family should be thoroughly familiar with the dangers of fallout before anyone goes outside.

Livestock Care and Survival

During Hazardous Radiation

To continue producing food for your own and the country's survival, you must safeguard your farm and livestock as well as your family. The next two sections will suggest practical steps you can take to safeguard your livestock and crops from the effects of fallout.

Livestock are an important emergency food source. Special precautions must be taken to protect them from fallout. Like humans, animals can be injured by exposure to both gamma and beta radiation. Gamma rays can penetrate their bodies and damage or destroy tissue; beta rays can cause external injury if sufficient fallout collects on animal hides. Livestock may suffer internal injury if they eat enough fallout particles.

Cattle, sheep, and hogs react similarly to total gamma radiation exposure. They're usually healthy for several days, listless and depressed for 4 or 5 days, then irritable and feverish with acute skin sensitivity and little appetite. Other symptoms are diarrhea (especially in cattle and sheep), vomiting, excessive salivation, hemorrhaging, and loss of coordination and equilibrium. Few animals die when exposed to less than 250 roentgens, few survive after exposure to 1,000 or more (table 4). Very young and very old animals are especially vulnerable.

Table 4. Mortality of unsheltered animals after 24 hours' exposure to various radiation doses*

Species	Percent of mortality				
	100	80	50	20	0
	exposure dose in roentgens				
Cattle	650	600	500	450	300
Sheep	700	600	525	450	350
Swine	800	700	600	450	350
Poultry	1,200	1,100	900	600	400

* Reproduction of table 2 in *Protection of Food and Agriculture Against Nuclear Attack.* Agricultural Research Handbook No. 234. USDA, p. 11.

The effect of fallout on animal genes and fertility should not be a serious problem because radiation doses large enough to cause permanent sterility also cause death. Both male and female animals exposed to radiation and observed for several years showed no signs of permanent sterility even after exposure to near-fatal doses.

If animals are not exposed to enough gamma radiation to cause death, they usually won't get enough fallout on their coats nor will they eat or drink enough contaminated feed and water to cause serious injury or death. However, fallout particles lodged on hides may cause beta burns on the skin. These burns appear as discolored areas on the coat, flaky skin areas, or deep skin burns with swellings, weeping, and hair loss. Several days or weeks may pass before beta burns become visible. Experiments indicate that sheep are naturally protected from these burns because beta particles don't penetrate their thick fleeces.

Animals grazing on contaminated pasture or consuming contaminated feed and water can swallow some 200 different radioactive materials found in fallout particles. Among these is strontium 90, which is chemically similar to calcium. It concentrates in the bones and is secreted in the milk of dairy animals. Strontium 90 and other radioactive materials are an internal hazard to people who eat meat or drink milk from contaminated animals.

To protect your livestock, make sure they have adequate shelter and clean water and feed.

Shelter

Animal shelters should reduce the radiation exposure by the following percentages:

Breeding stock—96 percent (PF = 25)

Production animals—93 percent (PF = 15)

Market stock—80 percent (PF = 5)

The percentages and PF's are minimal.

With this protection, the breeding stock in heavy fallout areas would most likely survive; production animals would be sick but most would survive; and about half of the market animals might die within 30 days.

Specially constructed livestock fallout shelters or existing buildings with improved fallout protection give your livestock the most effective protection. The basement of a conventional two-story wooden barn with a hay-filled loft makes a good shelter. If tightly constructed, such a structure will admit about 20 percent of outside radiation. Concrete buildings offer better protection than wooden ones. Nevertheless, a tight wooden barn can cut radiation exposure in half, and even a shed without sides gives some protection. Table 5 shows the amount of protection different types of buildings offer.

Let's assume a specific fallout situation in order to get a better idea of the value of farm buildings as fallout protection. Suppose your farm is directly downwind from the surface explosion of one 10-megaton nuclear weapon, and wind speeds at higher altitudes carrying fallout are 60 miles per hour. The right-hand column in table 5 tells you how close to the explosion the building described gives adequate protection for cattle, sheep, or hogs. The second column from the left tells how much radiation the building admits. Use the table to rate your own farm buildings as livestock fallout shelters.

Figure 15 will give you an idea of the amount of protection your cattle, sheep, or hogs would need depending on the location of your farm in this pattern.

Plan your livestock shelters now; there won't be time when fallout warning comes. First look over your existing farm buildings; then decide what you can do to improve them. If you decide to build a special shelter, see the plans prepared by the Minnesota Agricultural Extension Service.

If it's impractical to improve the protection of your barn in advance, at least have materials and plans ready for improving protection quickly. But remember that no one knows how much warning time you'll have for making last-minute preparations.

Water, Feed, and Pasture

Even in heavy fallout areas, livestock can safely drink water from covered sources such as wells, cisterns, and springs. A few days after fallout stops, livestock may be able to drink from large ponds, lakes, and creeks because fallout particles will have settled to the bottom. Let USDA authorities check these open sources before allowing livestock to use them. If uncontaminated water is scarce, cut down the amount of feed you give livestock. Most animals can live 4 or 5 days without water if they aren't fed. As a last resort, let livestock drink contaminated water rather than die of thirst.

Any cover that protects feed from dust protects it from fallout. Grain stored in a permanent bin, silage stored in a covered silo, and hay stored in a tight barn are well protected and can be used when you can safely leave your shelter. Haystacks covered with tarpaulins or similar covers can also be used because fallout will be only on the covers, not in the feed. Fallout that settles directly on haystacks will contaminate only the outer portions. By carefully removing contaminated outer bales, you can use inner bales safely. Don't handle contaminated feed

Table 5. Fallout protection values of farm buildings for livestock

Type of building	Percent of outdoor radiation admitted	Protection factor	Nearest adequate downwind protection point (miles)
Large barns 50 x 80 x 35 feet high, basement built into hillside, with masonry walls, few windows, and 12 feet of baled hay in mow	5	20	100
Large barns with masonry walls, few windows, and 12 feet of baled hay in mow	10	10	120
Large barns with wood frame and full haymow	20	5	180
Medium-size two-story barns (30 to 50 feet long) of wood construction with empty mow (65 percent when mow is full). Any building similar to a two-story frame house	50	2	360
Large pole sheds and poultry houses	60	1.7	360
Small poultry and hog houses with normal openings	70	1.4	420
Small buildings with many openings	80	1.2	420
Open sheds with small lots	90	1.1	420
Open pasture	100	1.0	.....

until authorities say it's safe to do so, and be sure to follow any recommended precautions. If supplies of uncontaminated feed are limited, use available feed for milk cows and breeding animals.

USDA authorities will notify you when pastures become safe for grazing. In heavily contaminated areas this may take some time. It's best to house livestock without giving them access to pastures for as long as uncontaminated feed lasts. But it's better to keep animals alive on contaminated feed and pasture than let them die of starvation.

Dairy Cattle

Dairy cows should receive special attention because radioactive materials accumulate in milk. Keep dairy cattle in the best available shelter and give them clean feed and water. If time permits after you receive fallout warning, milk them. Reduce their feed and water to maintenance levels and, if possible, put young calves with cows to reduce the discomfort of full udders.

You may have to give cows contaminated feed if no other feed is available. Although milk from these cows may be unusable, once they're back on uncontaminated feed the amount of radioactive material in their milk will decrease rapidly. Some contaminated milk may be processed and stored until, because of radioactive decay, little radioactivity remains. Authorities measuring fallout will warn you when milk is unsafe for consumption. However, such warning could be delayed for some time in areas where the radioactive fallout is heaviest.

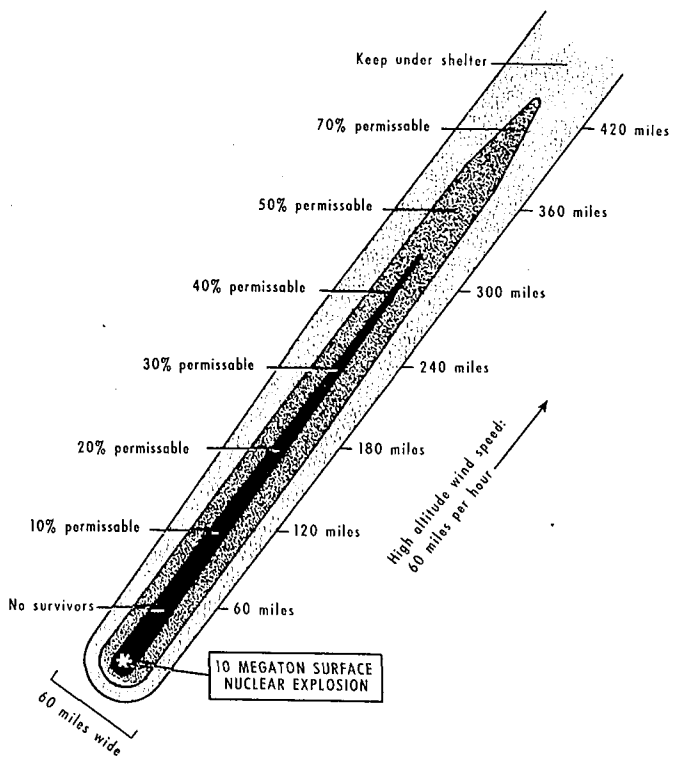

Figure 15. Percentages indicate radiation livestock would tolerate in this idealized fallout pattern.

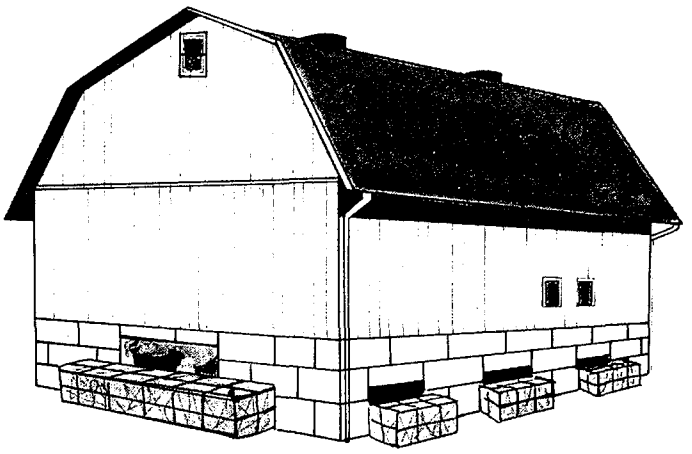

Figure 16. Bank baled hay to height of livestock in front of doors and low windows on masonry buildings.

Poultry

Poultry have a greater chance of surviving fallout than other animals because they're more resistant to radiation and they're accustomed to shelters. Also, most poultry feed on bagged grain stored under shelter. Even if hens eat contaminated feed, most of the radioactive materials in their eggs would collect in the shells. Thus, following a nuclear attack, poultry would be an important source of uncontaminated protein.

Electrical Power

Extended electrical outages are infrequent in Minnesota. Ice storms, however, have caused serious problems for farmers having large dairy, swine, and poultry operations, especially in southern Minnesota. A nationwide nuclear attack may cause outages lasting 4 or 5 days in some parts of the state.

Prepared farmers will have alternate means for pumping water, operating choring equipment, milking and ventilating, and other important farm operations requiring electrical power. Many farmers have purchased portable stand-by generators for operating essential equipment. Obtain additional information from dealers and the county extension office.

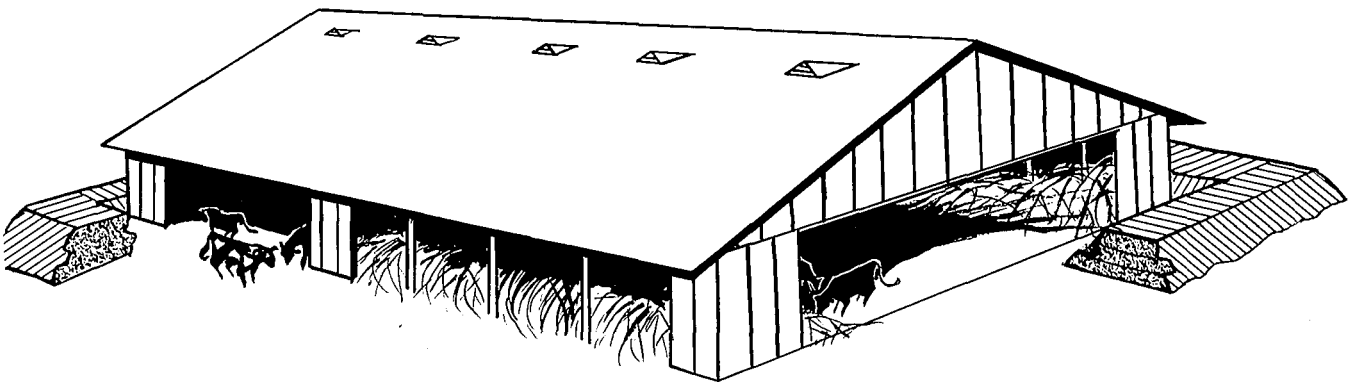

Figure 17. Use earth moving machinery to mound earth around building as high as stock.

What You Can Do

Now

Plan to carry out your farm protection measures in steps. Make essential preparations such as choosing shelter areas now and other preparations according to a specific schedule. Make separate plans for summer and winter emergency situations, floods, winter storms, and windstorms. In addition, delegate specific tasks to each member of your family to be done when you receive warning of the emergency, when fallout arrives, and after you can leave the shelter.

Table 6. Farm emergency schedule

FARM EMERGENCY SCHEDULE					
(Your name and address)				(Date of Plan)	
When	Who	Helpers or alternates	What	Where	How
		1st 2nd			

Write your plans down clearly so your family and workers will understand, remember, and correctly carry them out. A checklist posted on the inside of your barn door can tell who is to do what, when, where, and how. Its headings might look like those in table 6.

As you complete your plan, give each step a thorough testing to reveal weaknesses and allow for improvement ideas. Review, revise, and retest your plan periodically so you can be sure it's your best protective action.

Here are some steps you should plan:

Provide shelter, food, and water for your family and workers.

Decide which shelter areas to use for livestock and how these shelters can be improved. Plan to keep dairy cows in the best shelter area, breeding animals in the next best, and less valuable animals in whatever shelter is still available. Keep any animals that must be left outside in small enclosed lots near farm buildings to simplify care and observation.

Plan an efficient procedure for getting into shelter quickly when fallout warning comes.

Store feed and grain in weatherproof buildings. Place silage pits and haystacks close to livestock shelters and provide self-feeders or racks large enough to meet animal needs for 2 or 3 days.

Protect as large a water reserve as possible. Keep your well clean and covered.

Provide an auxiliary generator so there'll be electric power even if commercial power is off.

Keep extra batteries and tractor fuel on hand.

When You Receive Fallout Warning

Make sure your family is protected, then:

- Get livestock into shelter quickly.
- Give stock enough feed and water for a few days. If water is limited, limit feed also.
- Protect feed supplies by closing granary doors and covering any feed left outside.
- Carry out last-minute shelter improvement plans such as blocking windows and doors with concrete blocks or baled hay, covering trench silos, piling earth around pole buildings.
- Milk cows and reduce their feed to maintenance levels.
- Move farm machinery and equipment indoors or cover to reduce decontamination problems.

Above all, don't take chances with fallout. Never unnecessarily expose yourself, your family, or workers to radiation.

When You Can Go Outside

Civil defense authorities will notify you when and for how long it's safe to leave your shelter. At first the length of time you can remain outdoors will be short but it will increase as fallout decays.

To efficiently carry out chores and cleanup operations, plan a work schedule each evening. Your guiding principle in planning these schedules should be to keep radiation exposure at the lowest practical limit. Schedules should vary with radiation intensity and the urgency of your tasks. Postpone all but the most urgent tasks as long as possible to take advantage of radioactive decay. Whenever possible, divide work among adults to keep everyone's exposure time down. Because exposure to radiation can increase the probability of genetic defects and may have harmful effects in later life, adults past the reproductive age should perform tasks involving exposure.

Government authorities, when planning urgent lifesaving operations, may consider 200 roentgens the maximum radiation dose for emergency workers. Most people exposed to this amount of radiation would suffer nausea and weakness but could continue working. Some authorities suggest a maximum exposure of 50 roentgens, especially when greater exposure is not absolutely necessary.

How soon you can safely leave shelter and go to areas with little or no fallout protection and how long you can safely remain will depend on several factors, the most important being radiation rate in the area and amount of your previous exposure to radiation.

If you have had good fallout protection and have been exposed to relatively little radiation (50 roentgens, for example), you can go outside sooner and stay longer than if you have had poor protection. If you have been exposed to more radiation (150 roentgens, for example), you should wait until the radiation rate is lower or stay outside for a shorter period of time to keep your total exposure below a dangerous level.

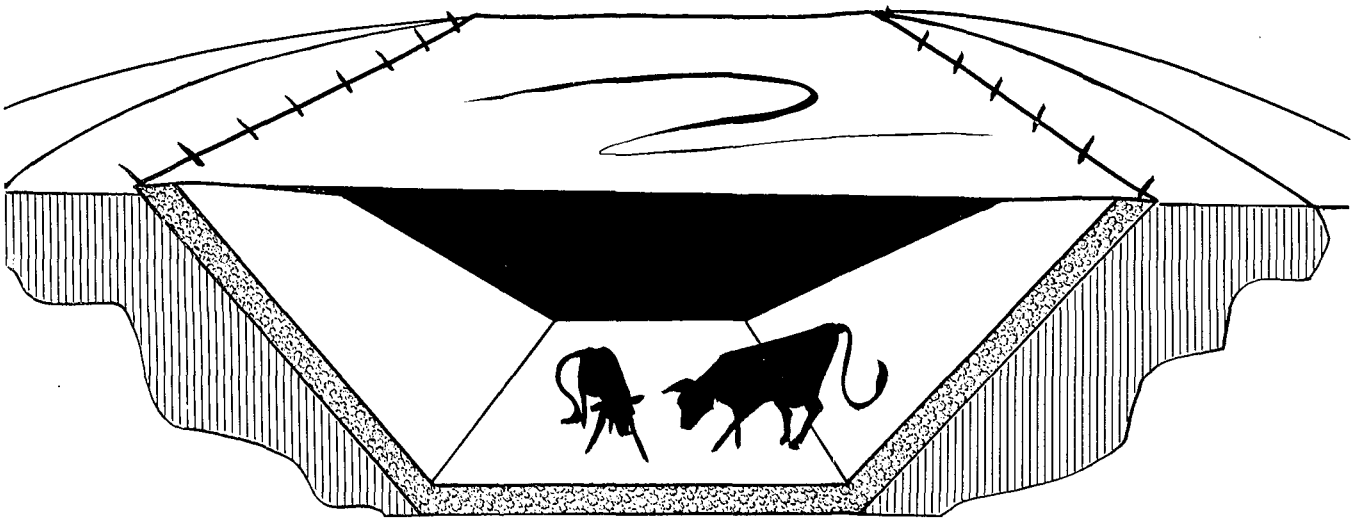

Figure 18. Use tarpaulin to keep fallout out of trench. Remove it and fallout dust when most of fallout is down.

You'll need radiation measuring instruments to keep track of exposure. In order to be outside safely your inside hours should be spent in the best shelter available. If your work is in livestock buildings, exposure will be less than that outdoors and your work time can be longer.

Caution: If you absolutely must go outside before fallout is down, wear dust-tight clothes. Take them off before reentering the shelter and wash exposed skin to remove fallout thoroughly.

During these periods you can perform regular chores and begin cleanup operations. You may be advised to hose down and scrub animals directly exposed to fallout and to scrub out stables, barns, and other buildings. When handling animals, wear coveralls, gloves, and boots.

Some animals may die from radiation sickness a short time after exposure. Their carcasses will probably not be dangerous and can be buried safely. If fallout is heavy, USDA officials will issue special instructions for your protection in handling contaminated carcasses. Don't slaughter animals with symptoms of radiation sickness unless authorities advise it. Separate these animals from the herd as radiation sickness will make them more susceptible to other diseases that could spread.

After an attack, your healthy animals may be needed for food. Meat from animals exposed to fallout will usually be safe if animals are slaughtered 2 to 8 days after exposure to or recovery from radiation sickness. Slaughter only those animals that appear healthy and have normal temperatures. Handle carcasses carefully to avoid transferring fallout from hide and intestines to meat. Discard all internal organs.

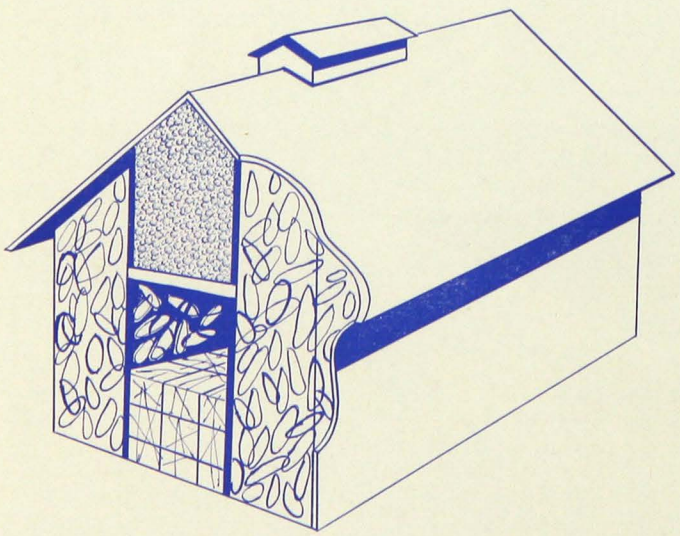

Figure 19. Use double cribs as livestock shelters.

Figure 20. Covered feed is protected from fallout and safe for livestock.

Postattack Care of Crops and Soils

After a massive attack, fallout will contaminate large areas of cropland. In heavy fallout areas, farming procedures will have to be altered drastically until radiation disappears. In lightly affected areas, normal farming can be continued, as crops will be affected very little.

How long radiation affects crops and soil in an area depends upon the amount of fallout. Some radioactive materials decay rapidly and won't be hazardous after a few days but some, including strontium 90, decay very slowly and will exist for years.

Standing Crops

Whether or not you can save standing crops depends on their stage of growth when fallout occurs and how long you must wait before harvesting them. Crops ready for harvesting when fallout occurs might be lost because it may be too dangerous to expose workers to radiation, but you may be able to save crops approaching maturity when fallout occurs.

You might have to monitor grain before using it. However, since premilling, threshing, and cleaning processes are designed to remove dust, most fallout particles will be removed with it. USDA agencies will provide guidance concerning crop decontamination. They will also tell you which crops, pasturage, and methods are safest to use.

Crops Growing in Contaminated Soil

Crops growing in contaminated soil will absorb some long-lived radioactive materials. The most hazardous of

these materials is strontium 90 which is absorbed in place of or along with calcium. Strontium 90 is absorbed in different amounts and stored at different locations by various species. Strontium can be absorbed by successive crops for several years.

The definite effects of eating food containing strontium are not known, but it's suspected that bone cancer and leukemia are two of them. Therefore, although farmers can't be expected to produce entirely uncontaminated crops, it is very important that all food crops be low in strontium; thus soil contamination must be reduced as much as possible.

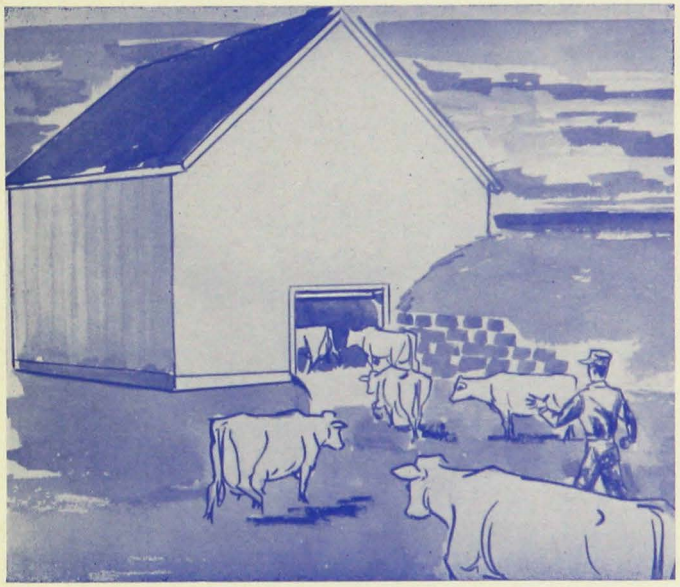

Figure 21. When fallout warning comes, get livestock under shelter quickly.

Grazing Pasture

During the first 30 days immediately after radioactive fallout from a nuclear explosion, a radiation level of 0.2 roentgen per hour on pasture land is within acceptable risk limits. If at any time during the first 30 days after nuclear explosions, the radiation level decreases to 0.2 roentgens per hour, pasture land can then safely be used for the remainder of the 30-day period. Cows that are to be used to produce milk for infants shouldn't be permitted to graze on pasture land where the radiation level exceeds 0.06 roentgen per hour.

Heavily Contaminated Soil

Don't undertake drastic decontamination measures unless USDA authorities determine that your land is excessively radioactive. If it is, you may be advised to leave it idle or to substitute nonfood crops until strontium has decayed to a safe level. Although deep plowing

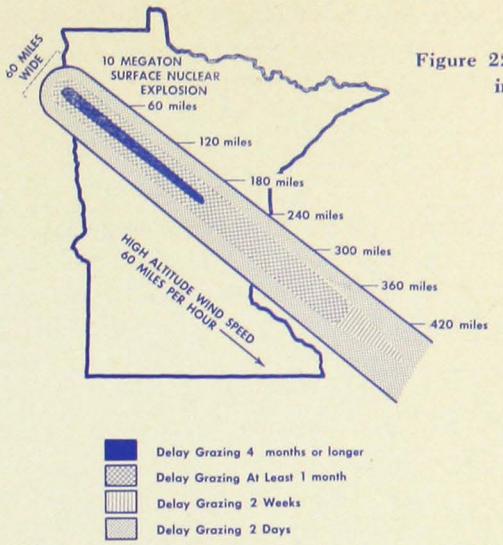

Figure 22. Possible delays in grazing.

or scraping off the top layer of soil is too expensive and impractical for large areas, either method can be used if a small plot of highly contaminated land is needed. Scraped off soil should be buried in an isolated area that does not drain into a water supply.

Your soil may be contaminated at a level that makes it unsafe for some crops but safe for others. In this case, you may be advised to substitute low-calcium-content crops such as potatoes, corn, sugar beets, and oil crops. Pastures unsafe for dairy cattle may be safe for beef cattle and other meat animals since strontium collects in their bones, not in their muscles. However, meat produced on contaminated land will have to be boned, closely inspected, and monitored before use.

Place heavily contaminated land in production only when its use is absolutely necessary. The degree of decontamination needed will depend on the crop to be grown and the availability of manpower, fuel, and equipment.

Figure 23. Combining and threshing will remove fallout dust.

Figure 24 illustrates possible delays in working fields. USDA scientists will analyze contaminated soil and make recommendations for safe uses.

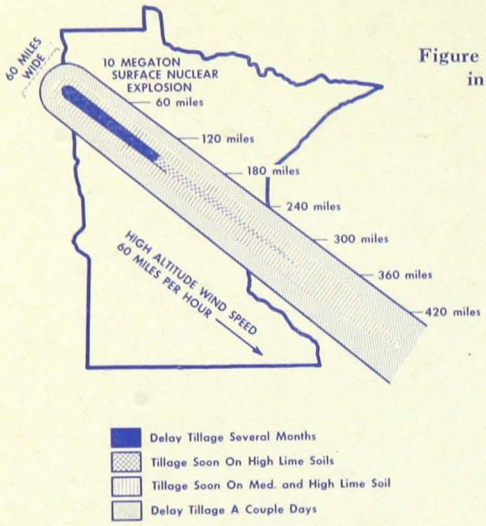

Figure 24. Possible delays in working fields.

Lightly Contaminated Soil

The most effective ways to treat lightly contaminated soil are fertilization or removing ground cover.

If you normally lime and fertilize your soil for greater crop yields, continue to use the same amounts to reduce strontium uptake by plants. Lime applied to acid or infertile soil might reduce the strontium absorbed as much as two-thirds. Using lime on neutral or alkaline soil won't reduce strontium absorption significantly. Be sure to use no more lime than is needed for optimum growth of plants.

Adding potassium, crop residues, and manure will also reduce the amount of radioactive materials plants absorb. Your county agent will recommend the amount of fertilizer to use per acre. Because fertilizers may be scarce during an emergency, the Department of Agriculture will control fertilizer sale and distribution. Your county Agricultural Stabilization and Conservation Service office will help you obtain what you need.

Decontamination by removing crop residues is especially effective when the crop cover is thick. Standing crops provide a less complete ground cover than mulches. If the latter are on the ground when fallout begins, they form a cover that may retain up to 90 percent of the fallout.

Safe disposal of contaminated mulch and crop residues is important. You can reduce their bulk by baling and burning them, but their ashes must be buried where they can't affect water supplies.

Figure 25. USDA technicians will measure radiation danger on farmland and livestock after a nuclear attack.

Crop Contamination by Irrigation Water

Irrigation water will deposit little radioactive material compared to the amounts deposited by direct fallout. But make sure the water in your irrigation sprinklers is as safe as your drinking water.

Care of Farm Machinery

For harvesting and decontaminating crops after fallout, your farm equipment must be in good repair, and you must have fuel and lubricants. So an early step in your plan should be to make sure all equipment is functioning properly. During a widespread disaster, USDA will control the sale of farm equipment and repair parts, and you might have to obtain a use certificate from the county Agricultural Stabilization and Conservation Service before purchasing them.

Store a 14-day reserve of fuel and lubricants for your tractor, truck, automobile, and small engines. To determine how much fuel you need for 14 days, check last year's fuel bill for the 2-week period in which you used the most fuel. Provide storage facilities for this and the amount you normally use between deliveries. If you have an underground tank with an electric fuel pump, equip it with a substitute means of pumping fuel. Equip gravity tanks with automatic shutoff valves; make sure that all of your aboveground tanks are at least 40 feet from buildings.

When a fallout warning comes, move unprotected vehicles and equipment into farm buildings and close windows and doors. If some equipment must remain outside, cover it with tarpaulins or plastic.

Table 7. Shelter supplies and equipment

Indicate person(s) responsible	Have on hand	Stored in shelter	Take into shelter
Cooking and serving			
_____			
Camp stove and fuel or canned heat			
Pots, pans, skillet			
Paper plates, cups, napkins			
Can opener			
Serving utensils			
Serving dishes			
Aluminum foil			
Matches			
Soap powder, dish towels			
_____			
_____			
_____			
Lighting			
_____			
Flashlight, batteries			
6-volt dry cell lantern			
Candles			
_____			
Sleeping			
_____			
Cots, bunks, or sleeping bags			
Blankets			
Plastic covers			
_____			
_____			
Communication and radiation detection			
_____			
Portable radio, extra batteries			
Radiation meters			
_____			
Sanitation			
_____			
Large garbage can			
Covered pail			
Paper bags, plastic bags			
Toilet tissue			
Disinfectant			
Deodorizers			
Insecticide			
Sanitary napkins			
_____			
_____			

Indicate person(s) responsible	Have on hand	Stored in shelter	Take into shelter
Clothing			
_____			
Warm clothes			
Boots			
Coveralls for outdoor work			
_____			
_____			
Food and water			
_____			
(see table 8)			
Personal supplies			
_____			
Deodorant			
Soap, towels, washcloths			
Toothbrushes, toothpaste			
Shaving equipment			
Dry shampoo			
_____			
_____			
Medical supplies			
_____			
First aid kit			
Prescription medicine			
_____			
Recreational supplies			
_____			
_____			
_____			
_____			
Baby supplies			
_____			
_____			
_____			
Other items			
_____			
Sewing kit			
Broom			
Screwdriver, pliers			
Hatchet, shovel			
Firefighting equipment			
Clock, calendar			
String or rope			
_____			
_____			
_____			
_____			

Table 8. Guide for reserve food supply*

Food	Amount per person for 1 day	Amount per person for 2 weeks	Number of servings per container (commercially canned foods usually have the number of servings printed on the container)
Dairy products			
Milk	(adults)		
	2 cups	7 quarts	Evaporated milk Three 6-ounce cans = 1 quart
	(teenagers)		
	4 cups	14 quarts	One 14-ounce can = about 1 quart
	(children)		Nonfat dry milk
	3 cups	10 quarts	One 1-pound container = 5 quarts
Powdered cream		Two 7-ounce jars	
Cheese spreads		Two 6-ounce jars	
Meat or equivalents Meat; fish; poultry; baked beans; mixtures of meat, vegetables, and cereals such as spaghetti and meat balls or chow mein (all commercially canned)	2 servings or 1 cup	28 servings or 14 cups (7 pints or pounds) Caution: some canned hams must be refrigerated.	Standard can sizes Size / Servings / Cups 6 ounce / 1½ / ¾ 8 ounce / 2 / 1 No. 1 / 3 to 4 / 1¼ No. 2 / 4 to 5 / 2½ No. 2½ / 6 to 7 / 3½ No. 3 / 8 to 12 / 5¾ No. 300 / 3 to 4 / 1¼ No. 303 / 4 / 2 No. 10 / 25 / 12
Fruits and vegetables Condensed vegetable soups, canned berries, canned citrus fruits and juices, dried fruits, instant potatoes, canned tomatoes, other canned fruits and vegetables	3 to 4 servings	42 to 56 servings (10 to 16 pints or pounds)	
Cereals and baked goods Uncooked cereals, canned baked items, crackers, rusks, Melba toast	3 to 4 servings	42 to 56 servings (10 to 16 pints or pounds)	
Fats and vegetable oils	Up to 1 pint or pound (Amount depends on extent of cooking possible. Store those requiring no refrigeration.)		
Sugars, sweets, nuts Sugar, hard candy, gum, nuts, instant pudding, jelly or jam, peanut butter	1 to 2 pounds		
Miscellaneous Coffee, tea, cocoa (instant), bouillon products, flavored beverages (powdered), salt and pepper, special diet foods	According to family practices and extent of cooking possible.		
Water	½ gallon	7 gallons	

* The amounts recommended in this table are based on a daily diet of 2,000 calories; most people can subsist on one-half to two-thirds of these amounts for up to 2 weeks.

Table 9. Our family food reserve

Foods needed for our family _____ persons	Amount needed for 2 weeks _____ persons*	Amount stored	Where stored	Date purchased
Dairy products				
Milk				
Powdered cream				
Cheese spreads				
Meats or equivalents				
Meat				
Fish				
Poultry				
Fruits and vegetables				
Condensed vegetable soups				
Canned fruits and berries				
Canned fruit juices				
Dried fruits				
Instant potatoes				
Canned vegetables				
Cereals and baked goods				
Uncooked cereals				
Canned baked goods				
Crackers, rusks, Melba toast				
Fats and vegetable oils				
Sugars, sweets, nuts				
Sugar				
Hard candy				
Gum				
Nuts				
Instant pudding				
Jelly or jam				
Peanut butter				
Miscellaneous				
Coffee				
Tea				
Cocoa				
Flavored beverages				
Bouillon products				
Salt and pepper				
Special diet foods				

* To determine the amounts of various foods your family needs, multiply the number of persons in your family by the amount needed per person for 2 weeks found in column 2 of table 8.

Table 10. Suggested first aid kit

For these purposes	Use these	Or these	Suggested quantity
Open wounds, scratches or cuts	Antiseptic solution: Benzalkonium chloride solution, U.S.P., 1 to 1,000 parts of water.	Quarternary ammonium compounds in water. Sold under trade names such as Zephirin, Phemerol, Ceepryn, and Diaprene chlorides.	3- to 6-ounce bottle
Faintness	Aromatic spirits of ammonia. Adult dose ½ teaspoon in cup of water; children 5 to 10 drops in ½ glass of water. As smelling salts, remove stopper, hold bottle under nose.	Inhalation aromatic ammonia ampules.	1- to 2-ounce bottle
Shock	Table salt and baking soda; dissolve 1 teaspoon salt and ½ teaspoon baking soda in 1 quart water. Have person drink as much of it as he can. Don't give to unconscious or semiconscious person.	Sodium chloride tablets (10 grain, 50 tablets in bottle) and sodium bicarbonate or sodium citrate tablets (5 grain, 50 tablets in bottle). Dissolve six 10 grain sodium chloride tablets and six 5 grain sodium bicarbonate tablets in 1 quart water.	1 box each
A sling; as a cover; for a dressing	Triangular bandage, folded, sterile, 37″ x 37″ x 52″ with 2 safety pins.	Muslin or other strong material. Cut to exact dimensions. Fold and wrap each bandage and 2 safety pins separately in paper.	4 bandages
Open wounds or dry dressings for burns	Sterile gauze squares (individually wrapped 3″ x 3″) and 1- and 2-inch gauze roller bandages.	None.	6 squares— 1 roll each
Eye irritations	Eye drops. Use two drops in each eye. Apply cold compresses every 20 minutes if possible.	None.	½- to 1-ounce bottle with dropper
Minor burns	Petroleum jelly in tube.	Burn ointment.	1 tube
To splint broken fingers or other small bones, to stir solutions	Wooden tongue blades.	Shingles, pieces of orange crate or other light wood cut to about 1″ x 6″.	12
Purifying water when it cannot be boiled (radioactive contamination cannot be neutralized or removed by boiling or disinfectants)	Water purification tablets (iodine, trade names—Globaline, Bursoline) or household bleach solution (about 5 percent available chlorine), 3 drops per quart.	Tincture of iodine or iodine solution (3 drops per quart).	Bottle of 50 or 100 1 small bottle
Administering stimulants or liquids	Paper drinking cups.		25 to 50
Holding bandages in place	Safety pins, 1½-inches long.		12 to 15
Cutting bandages or dressing, removing clothing from injured body surface	Single-edge razor blades, scissors.	Sharp knife.	3
Cleansing skin	Liquid or cake soap containing hexachlorophene.	Any mild soap.	1 bar or small bottle
Measuring or stirring solutions	Measuring spoons.		1 set

Make Your Plans Now

If disaster strikes, your emergency plans will be a great help and comfort to you and your family. Although you hope your plans will never be used, the possibility of an emergency—natural or manmade—must be admitted. Plan with your family the jobs each person will have during a disaster. Then, if an emergency does arise, your chances of survival will be much better.

For more information on emergency preparedness and recovery ask your county agricultural agent or local civil defense director for these brochures:

Fallout Protection—What to Know and Do About Nuclear Attack, Department of Defense, Office of Civil Defense, H-6.

Family Shelter Designs, Department of Defense, Office of Civil Defense, H-7.

Radioactive Fallout on the Farm, USDA Farmers' Bulletin No. 2107.

First Aid for Flooded Homes and Farms, USDA, AH-38.

What the USDA Can Do When Natural Disaster Strikes, USDA, PA-533.

How the USDA will help . . . In the Event of a National Emergency, University of Minnesota, RCD-2.

Improving Family Protection Areas in Basements, University of Minnesota, RCD-9.

Preparing for Floods—Flood Cleanup and Salvage Steps, University of Minnesota, RCD-6.

Knowledge for Emergencies, University of Minnesota, RCD-8.